

MICRO PRODUCTS COMPANY

MANUFACTURES OF PRECISION
WELDING MACHINES

MODEL GP0 CERAMIC FUSION BUTT WELDER

SERVICE MANUAL

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1.0 SPECIFICATIONS

MODEL GP0

Stock Size Range	26GA. to 18GA.
Type Material	Stranded copper conductor
Operating Voltage	115 Volts
Input Power Cycle	60 Cycle (50 Cycle optional)
Line Demand	6 Amperes @100% Duty Cycle 19 Amperes @10% Duty Cycle
Single Phase Weld Transformer	1.0 KVA @50% Duty Cycle
Truck Mounted Welder	2 Stationary Casters 2 Swivel Casters
Floor Space	24" x 24"
Overall Height	57"
Height to Welding Dies	44"
Welder Weight	Approx. 120 LBS
SUITABLE FOR BENCH MOUNTING	
Dimensions	
Overall Height	29"
Base Dimensions	11" x 18"
Height from Base to Welding Dies	12.5"
Welder Weight	Approx. 70LBS.

2.0 GENERAL OPERATING INSTRUCTIONS

2.1 ELECTRICAL HOOK-UP INSTRUCTIONS

First determine that available electrical service in your plant corresponds to the nameplate rating located on welder housing. Electrical wiring to welder must be of sufficient size to deliver full ampere load with no appreciable loss during the weld cycle. The welder will not operate properly if there is more than a 10% variation in the line voltage. In general, the welder should be fused with a slow blow fuse of the 100% duty cycle rating. The minimum power cable size to the welder can be obtained by using this same current rating.

Refer to National Electrical Code and local electrical regulations for adequate power sizes; disconnect methods and fusing guidelines.

Remember line voltages to the welding machine are potentially dangerous should the power cords be damaged or severed. The welding voltages at the welding dies will not harm an operator since they do not exceed 10 volts.

2.2 SAFETY PRECAUTIONS

2.2.1 ELECTRICAL

Maintain electrical cables to welder in good repair. Welders must be grounded and connections securely tightened. Heat switch must not be changed to a new position while a weld cycle is in process. Disconnect electrical service before servicing the welder - high voltages are located within the base of the welder.

2.2.2 MECHANICAL

Operator while using welder must wear safety glasses. Keep all safety guards on welders and use properly. Operators must be instructed on the basic operation of unit to prevent injury. Check nameplate rating and keep within material size range for each welder.

2.3 WELDING DIES

The dies and shoes supplied with the welder will handle most size and material types within the range of the welder. For new weld applications consult the factory for special die and shoe sets.

3.0 BASIC OPERATING PARTS

3.1 WELD HEAT SELECTION SWITCH

Weld heat is selected by means of a tap switch with 10 steps of voltage. Number one indicates the highest setting and number ten the lowest. The switch is located in the front and center of the welder. (Ref. 4.0)

3.2 HEAD CLOSED SPACE SETTING

Turning the insulated screw that rides the space-adjusting cam located on the top of the headpiece makes this adjustment.

3.3 HEAD OPEN SPACE SETTING

A space-adjusting cam located on the top of the headpiece makes this adjustment. This setting determines the amount of burr that the weld will have. See charts for approximate settings.

3.4 LIMIT SWITCH SETTING

The weld limit switch controls the cutoff point of current flow to the welding dies. Turning an adjusting screw located on the left end of the movable headpiece makes this adjustment. See Charts for setting.

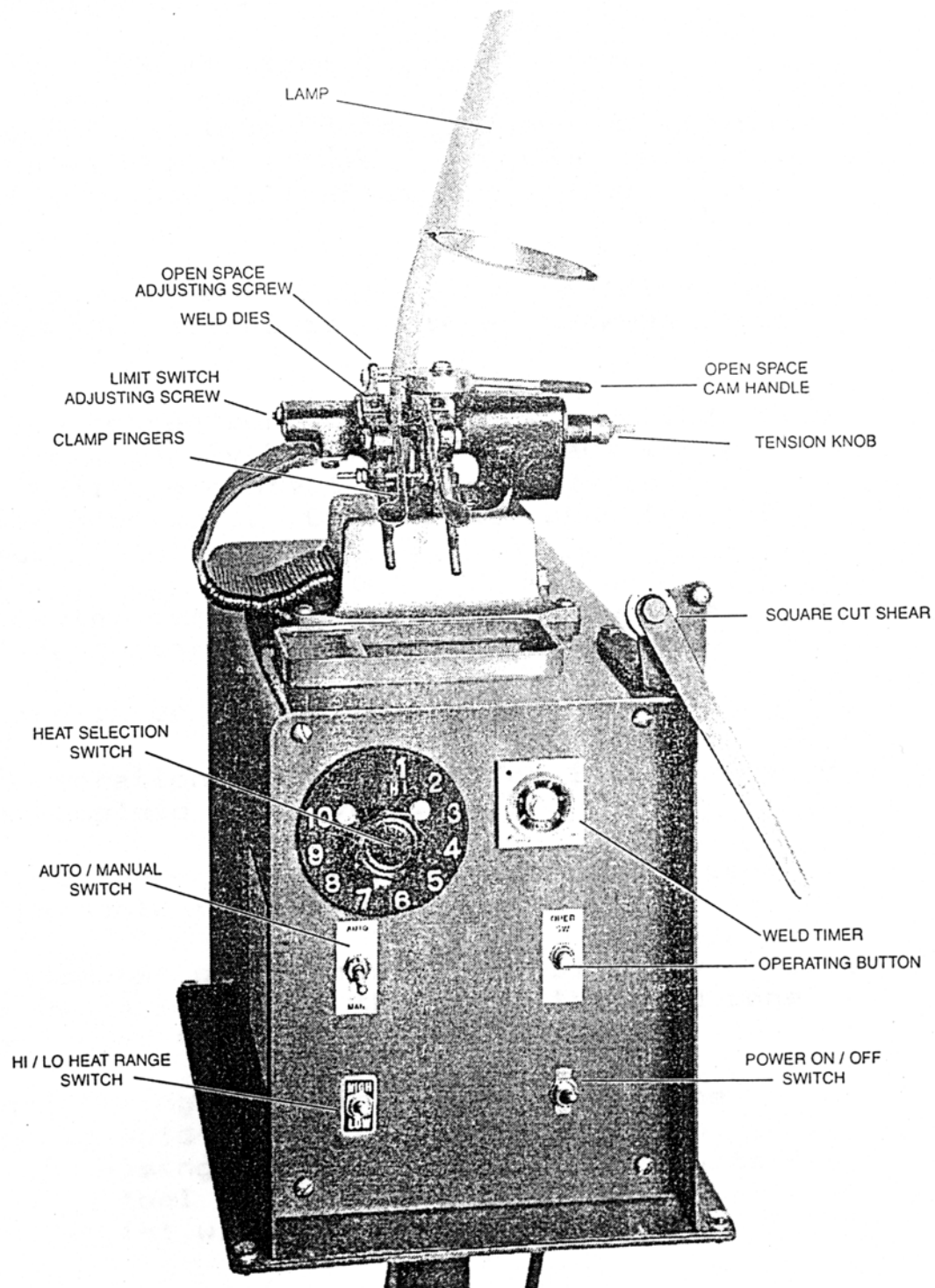
3.5 UPSET PRESSURE

Upset pressure adjustments are obtained by rotating the knurled knob on the right hand side of the stationary headpiece. When the outside edge of the adjusting screw is flush with outside edge of the knurled knob, the movable headpiece should just close when pulled to the left by hand and released. A calibrating screw and nuts located on the opposite left hand headpiece will assist in setting this positioning. Accompanying charts will assist in correct settings for various sizes of wire.

3.6 WELD INITIATING KNOB

The push button knob that initiates the weld cycle is located on the right front of the welder enclosure.

4.0 BASIC OPERATING PARTS LOCATION



5.0 TYPICAL OPERATING SEQUENCE

- 5.1 Wire must be clean and free of dirt and oil.
- 5.2 Set weld heat switch to recommended setting (Ref 8.0)
- 5.3 Set hi-low range switch (Ref 8.0)
- 5.4 Set upset pressure (Ref 8.0)
- 5.5 Rotate space cam to open stop (1/4" between dies)
- 5.6 Twist conductor end in direction of natural lay.
- 5.7 Carefully square cut conductor ends so no individual wires extend beyond cut.
- 5.8 Select correct size of ceramic sleeve.
- 5.9 Thread conductor end into ceramic sleeve so as wire ends are midway through sleeve. Rotating ceramic in direction of wire lay will assist threading procedure.
- 5.10 Clamp preset conductor and sleeve into welding die set, so as ceramic sleeve is centered between open welding dies.
- 5.11 Thread other prepared conductor into sleeve and allow the conductor to gently but firmly contact first conductor. Positive contact to wire ends is important for good weld. Clamp that conductor into welding dies.
- 5.12 Rotate and center ceramic sleeve to assure free movement of conductors during weld process.
- 5.13 Rotate spacing lever to 0.
- 5.14 Depress the operation switch, hold for 1 to 3 seconds to assure a complete weld cycle.
- 5.15 Unclamp welded conductor and remove ceramic sleeve. Fracture expendable type sleeve.
- 5.16 The inside diameter of ceramic sleeve slightly exceeds the nominal conductor size, therefore the weld zone is slightly larger than conductor diameter.
- 5.17 An additional sizing operation, swaging, may be required should weld zone exceed tolerances on subsequent processing operations. Micro Products has a special swage tool with exchangeable tooling available to assist with this sizing operation.
- 5.18 The above operation applies to either auto or manual. When the auto manual switch is in auto, the weld time will be limited to that selected on the timer.

6.0 SPECIAL ADJUSTMENT

6.1 HEADPIECE CLOSED SPACE ADJUSTMENT

Closed space between dies should be $7/32$ " when the space-adjusting cam is set at zero.

To make this adjustment first move the space-adjusting cam to zero, then check the spacing between the dies.

If the space between the dies is not $7/32$ " at this time, loosen the locknut on the space adjusting screw. Turn screw clockwise for more space and counterclockwise for less space. Once space has been set tighten the locknut on the space adjusting screw.

6.2 OPEN SPACE ADJUSTMENT

This adjustment determines the amount of upset burr. The adjustment is made by the space-adjusting cam. A pointer reflects the cam positioning. Refer to accompanying charts for approximate settings.

6.3 WELD LIMIT SWITCH

Do not put any wire in the dies when making this adjustment. Set the space-adjusting cam at #1 on cam. With a voltmeter measure across the clamp fingers with power applied to the welder. Press the weld button. The voltmeter reading should be approximately one VAC with welder at the highest heat setting. If no voltage is read move the space cam to higher number. Return the cam to #1 while watching the voltmeter. The voltage should shut off at #1 on the cam.

Loosen locknut on the limit switch adjusting screw and adjust until the welder shuts off at #1 on the space-adjusting cam. After setting tighten locknut on the limit switch adjusting screw.

6.4 UPSET PRESSURE

Upset pressure adjustments are obtained by rotating knurled knob on right hand side of stationary headpiece. When outside edge of upset adjusting screw is flush with outside edge of thumb knob, movable headpiece should just close when pulled to the left by hand. A calibrating screw and nut located on right hand headpiece will assist in setting the neutral position. Accompanying charts will assist in correct setting for neutral position. Accompanying charts will assist in correct setting for various sizes of wire.

7.0 PREVENTIVE MAINTENANCE

7.1 AS REQUIRED:

Flashings must be removed from between welding dies and clamp fingers with a brush. If flashings are attached so that they cannot be removed by brushing with a soft wire brush, they may be broken loose with a scraper made of fiber or wood.

7.2 DAILY:

- 7.2.1 Check condition of welding dies and clamp fingers. Replace Dies or clamp fingers when they have become so worn that stock does not align or there is slipping of stock in the dies during upset pressure.
- 7.2.2 Check condition of clamp springs. Replace all broken springs or springs that have taken a set.
- 7.2.3 Check movable head for excessive wear. Have new slide shafts installed and die seats machined if stock does not line up when placed in die grooves.

7.3 MONTHLY:

- 7.3.1 Remove welding dies and clean bottom of die surface with #120 emery cloth. Do this by placing the emery cloth on a flat surface plate and rubbing the dies on it, keeping the surface of the die flat. Wipe die and die seat with a clean cloth and replace, taking care not to touch either contact surface with the hand.
- 7.3.2 Check anneal dies and replace worn or broken parts.
- 7.3.3 Check insulating fiber pin on limit switch adjusting screw for broken or frayed ends.
- 7.3.4 Check upset tension spring and clamp springs. Replace if springs have been over-stretched and will not return to normal position.

7.4 QUARTERLY:

- 7.4.1 Disconnect power to welder. Check contacts on operating and limit switch. Replace those that are burned.
- 7.4.2 Check anneal dies and replace worn or broken parts.
- 7.4.3 Check insulating fiber pin on limit switch adjusting screw for broken or frayed ends.
- 7.4.4 Check upset tension spring and clamp springs. Replace if springs have been over-stretched and will not return to normal position.

7.5 ANNUALLY:

- 7.5.1** Remove the movable headpiece and check condition of slide shafts. Wash slide shafts with low residue cleaner, lightly oil and replace headpiece.
- 7.5.2** Check condition of headpiece castings. If worn or broken, replace with new headpiece. If welder is used in an area where there are corrosive fumes, clean off all oxides and paint where possible.

7.6 WELDING DIE INFORMATION

Description:

Welding dies - Lower conducting electrode and clamp jaw.
Welding clamp fingers - Upper clamping member.

WELDING DIES IN POOR CONDITION ARE THE MAIN CAUSES OF BAD WELDS.

7.6.0 CARE OF DIE SETS

- 7.6.1** Use a Brass or fiber blade to remove particles of flashings that build-up on die sets. Excessive flash build-up causes die burns on material and shorting of die sets.
- 7.6.2** Do not attempt to clamp material that is not suited for welder into die sets. Undersize materials will slip and burn die grooves, oversized materials will overstress clamping parts.
- 7.6.3** Do not use welding die sets for a vise. These parts will not withstand the mechanical abuse.
- 7.6.4** Whenever welding dies are replaced, clean bottoms of dies and corresponding die seats to a bright and clean condition before bolting them tightly into place. An oxidized surface will insulate the welding dies and reduce effective welding voltage.
- 7.6.5** Welding die sets will wear with use and must be changed occasionally for good welding results. Keep an adequate supply of replacement parts available. Wire and rod slippage is a problem caused by poor die sets and a major cause of wire breaks.

8.0 SUGGESTED SETTINGS

STOCK STRANDED	SIZE WIRE	HEAT	TENSION	HEADPIECE OPEN SPACE	LIMIT SWITCH
COPPER	26 GA.	10H	1	5	
COPPER	24 GA.	9H	1.5	6	
COPPER	22 GA.	8H	2	6	
COPPER	20 GA.	7H	3	6	
COPPER	18 GA.	6H	3.5	7	

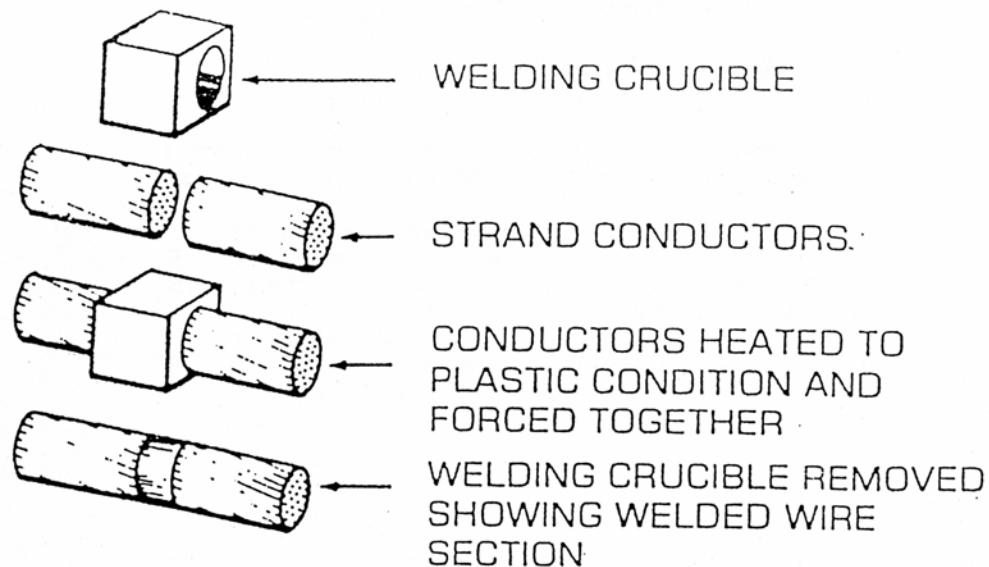
NOTE: These settings are approximate and may be varied to suit needs.

8.1 WELDED STRAND OR BUNCHED COPPER AND ALUMINUM WIRE CONDUCTORS

THEORY: Welds are formed within a ceramic tube of block and no filler materials are needed.

Wire ends are resistance heated to a plastic condition and hot forged together within a ceramic tool, which acts as a crucible. The resultant coalescence (weld) locks all single filaments into a solid weld zone...Since strand conductors have configuration voids on the fraying surfaces, the plastic material normally forced to the outside on a normal weld, is forced into the voids eliminating the upset burr common with standard upset welds. (This type of weld is not suitable for solid wire.)

8.2 CERAMIC FUSION TECHNIQUE



9.0 DIAGNOSTIC CHART FOR TROUBLE-SHOOTING SERVICE HINTS FOR STRAND CONDUCTOR WELDERS

Conductors must be able to slide freely within ceramic tools during weld cycle, therefore rotate and move ceramic tool side to side prior to welding. Be sure to center ceramic tool between die sets.

Example of porosity in weld zone

Example of a void in weld zone

Porosity and voids in weld zone may be corrected by using one or more of the following suggestions.

1. Increase upset pressure.
2. Decrease weld heat.
3. Readjust timing point of weld heat cut-off, limit switch adjustment, to allow heat to cut-off slightly sooner.
4. Check to make sure conductor is not binding in ceramic tool.

Weld nugget

Example of poorly fused weld nugget because of small solid area.

Example of properly fused weld nugget (approximate solid area of two times diameter of conductor).

Amount and length of weld nugget (solid portion of weld) can be varied by one or more of the following suggestions.

1. Increase starting space between die sets when weld nugget is small.
2. Decrease space between die sets when weld nugget is too large.
3. Adjusting limit switch to hold on or cut-off current at a different position.

Fracturing of ceramic tools and bent conductors can be corrected by one or more of the following methods.

1. Decrease weld heat to prevent excessive softening of conductors on either side of sleeve.
2. Decrease starting space so as to decrease length of upset and amount of conductor exposed to heat.
3. Decrease upset pressure and still maintain a fused area.
4. A few of the very small stranded and bunched conductors just do not have enough mechanical strength to be processed by this process.

9.0 DIAGNOSTIC CHART FOR TROUBLE-SHOOTING WELDERS

WELDING ACTION	CAUSE	REMEDY
Molten metal is blown out and ends not joined	Weld heat too high Stock is too small Low upset pressure	Lower heat settings Check size rating of welder Adjust upset
Weld is complete but is dry and breaks off below surface of wire	Upset pressure too great	Lower upset pressure
Weld good but poorly aligned	Welding dies & clamp fingers Starting space Loose shafts	Replace worn dies and clamp fingers Decrease starting space Return heads to factory
Ends of wire buckle and may not weld	Upset pressure too great Low weld heat	Decrease starting space Increase weld heat
Varying weld results	Stock slipping Varying weld voltages Wire condition variations Dies Flashings	Check Clamp finger pressure Check electric lines Clean and tighten transformer connections to heads Clean wire where clamped in dies Replace dies Clean build-up of flash materials

9.1 ELECTRICAL TROUBLE-SHOOTING OF WELDER

(CAUTION! Extreme care should be exercised when making these tests. Dangerous voltages are present in the welder. Only persons familiar with electrical safety precautions should perform these tests.)

9.1.1 TROUBLE-SHOOTING TABLE

(See section 9.1.3)

This electrical trouble-shooting table is furnished as a suggested method of trouble-shooting the welder. The individual steps of the table should be performed in the order given, to make the tests valid. The electrical schematic (section 10) furnished for these tests show the table test points. The table may be used for welders with a different but closely related wiring by using corresponding test points. (During all tests, line voltage should be connected to L1 & L2 of the welder. The heat switch should be set to the #1 position.

9.1.2 FINAL ELECTRICAL CHECKS

Set the heat switch to the number 1 position, connect the voltmeter across the welding dies. Press the operating switch. The meter reading will typically be less than 10 VAC. Consult the weld specification sheet for this value.

Rotate the heat switch through all settings. If the voltage is not read at any setting, the heat switch may be defective. Actuate the weld limit switch; observe the reading goes to zero. Release the weld limit and operating switches, the reading should remain at zero.

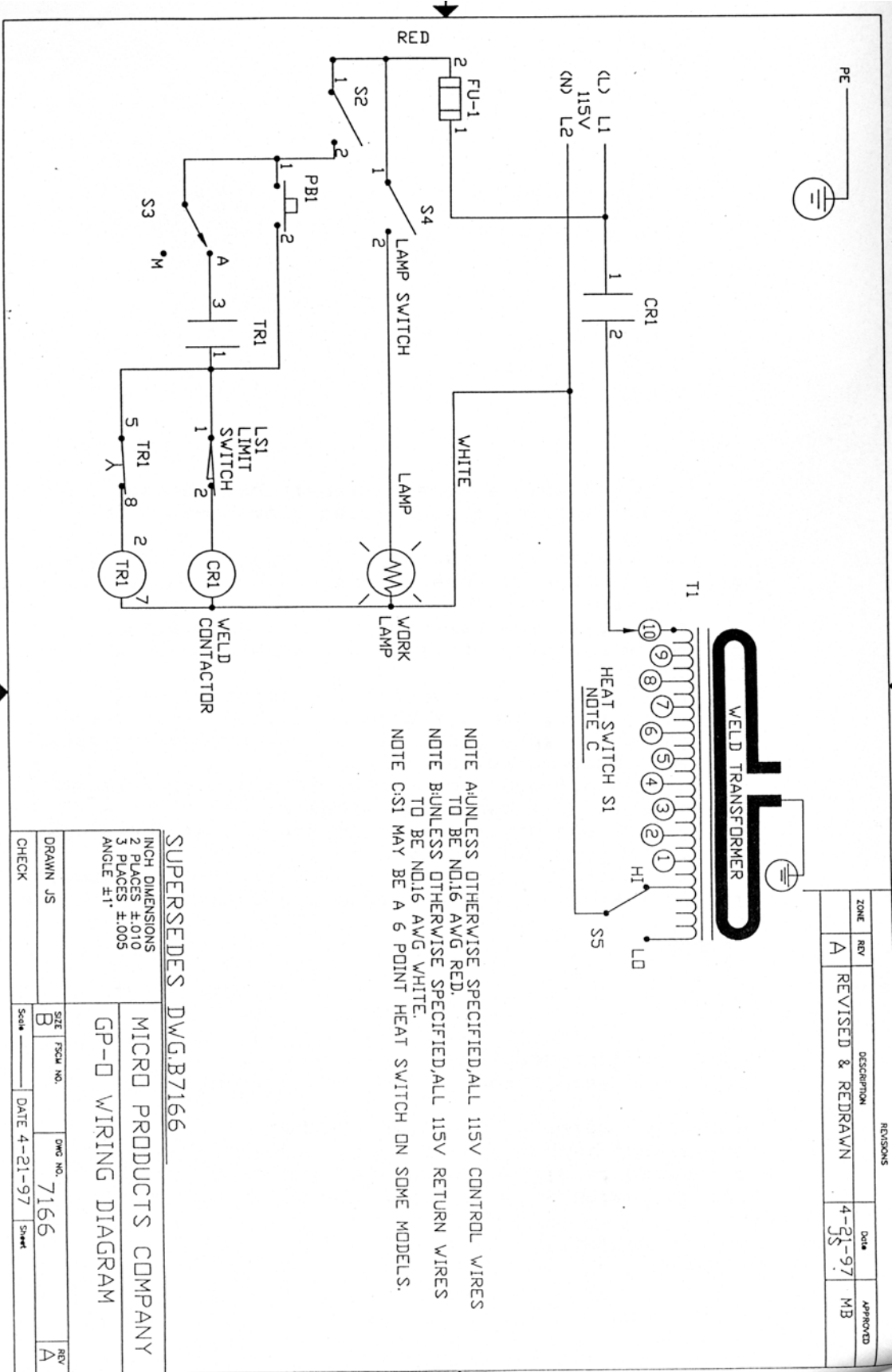
9.1.3

TEST LEAD CONNECTION	METER READING	PROBLEM IF NO READING	PRESS OPERATING SWITCH	WELD LIMIT SWITCH ACTUATED	AUTO/MANUAL SWITCH
L2 FU1-1	115VAC	Bad fuse connection			MANUAL
L2 FU1-2	115VAC	Open fuse			
L2 PB1-1	115VAC	Open wire to operating switch			
L2 PB1-2	115VAC	Bad operating switch	X		
L2 LS1-1	115VAC	Open connection to weld limit switch	X		
L2 LS1-2	115VAC	Open weld limit switch			
L2 CR1-1	115VAC	Open wire to contactor			
L2 CR1-2	115VAC	Bad contactor	X		
L2 S1-1	115VAC	Open wire to heat switch	X		
L2 TR1-8	115VAC*	Bad timer circuit momentary			AUTO

Note: to perform repair consult section 13 for parts identification.

S2 closed for all tests.

*Voltage present for 1 sec. when timer is set to 1 sec.



REVISIONS			
ZONE	REV	DESCRIPTION	DATE
A	REVISED & REDRAWN	4-21-97	MB

SUPERSEDES DWG. B7166

INCH DIMENSIONS 2 PLACES ±.010 3 PLACES ±.005 ANGLE ±1°			
MICRO PRODUCTS COMPANY			
GP-Q WIRING DIAGRAM			
DRAWN JS	SIZE B	FORM NO. 7166	REV A
CHECK	DATE 4-21-97	SHEET	

11.0 SAFETY REMINDERS

The following accident prevention information is presented to eliminate potential hazards while operating, inspecting or repairing Micro-Weld Electric resistance welding equipment.

Important safety compliance information for Micro-Weld Welders.

GENERAL

1. Qualified personnel, prior to using equipment, must instruct an operator on basic operation and malfunction methods.
2. Safety eyeglasses must be worn by all personnel operating or servicing welders.
3. Use safety equipment properly and keep safety equipment on welders.
4. Determine that both operating voltages and hertz (cycles) of power supply correspond to ratings listed on welder nameplate located on welder housing.
5. Check nameplate ratings and keep within capacities and material categories stated therein.
6. Adjustments or repairs must be made by persons thoroughly familiar with operating principles of welder.
7. Welder must be disconnected from power supply prior to maintenance or repair procedures.

ELECTRICAL

1. Refer to national Electrical Code and local regulations for adequate electrical wiring to power welder. Do not operate welder with inadequate electrical power supply cords or cable.
2. All welders must be grounded through power supply and welder ground connection terminal securely tightened.
3. All welders must be able to be disconnected from power source either by a double breaking disconnect switch or unplugged by standard rated plugs.
4. All welders must be fused to prevent injury should an electrical malfunction occur. Welders must never be fused for an ampere load that exceeds the ratings stated on welder nameplate. Normally welders are fused using the nameplate rated load; time lag parameters functional to standard fuse allow this specification.
5. Electric power cords to welder must be kept in good condition. Report any damage or potential hazards to maintenance personnel.
6. The weld head selection switch, potentiometer or range selection devices must not be changed to a new position while a weld operation is in process.

12.0 BUYERS GUIDE

HOW TO ORDER PARTS:

You must provide

1. Machine Model
2. Machine Serial Number
3. Voltage

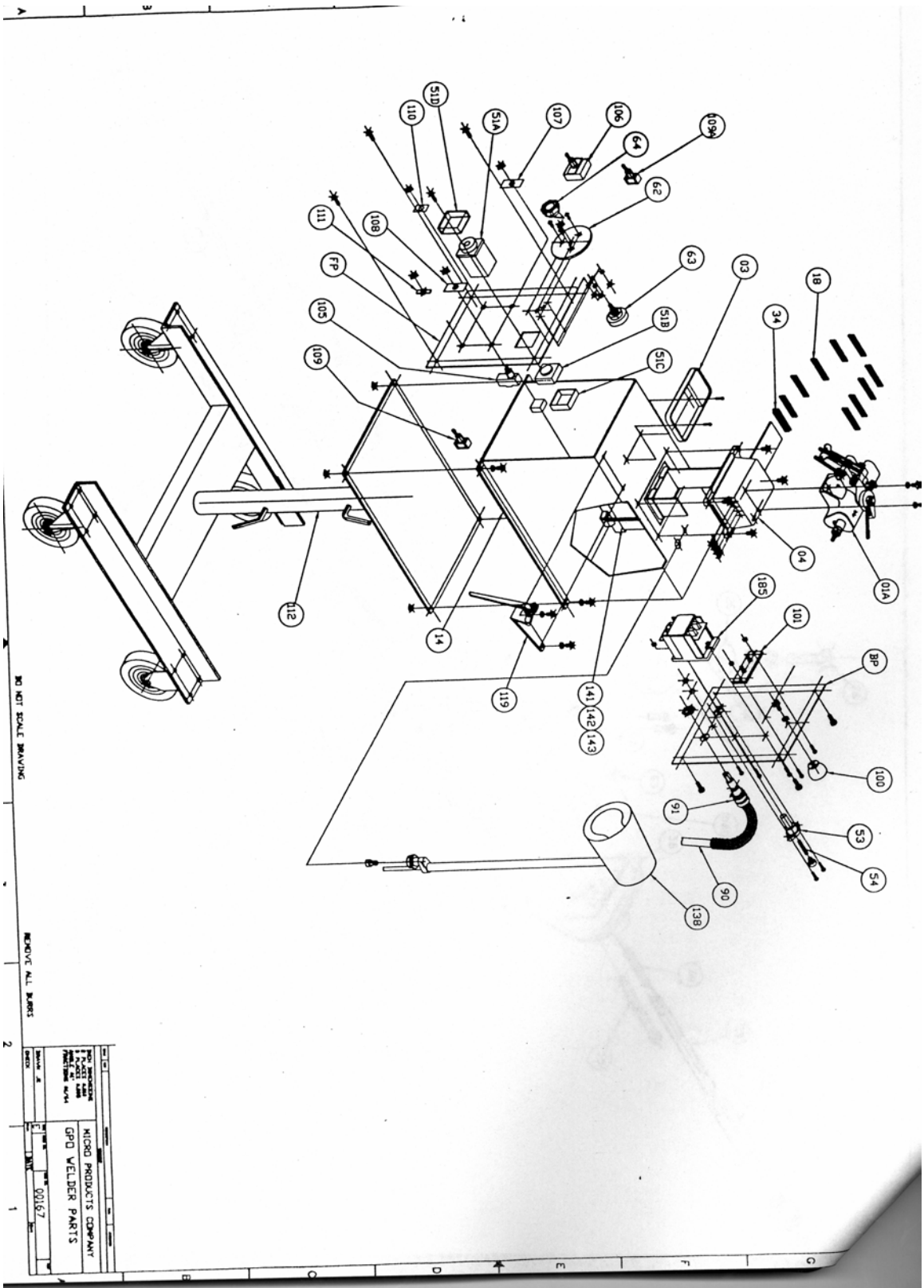
Then identify part(s) on part list in section 13 and provide MICRO with the circled number

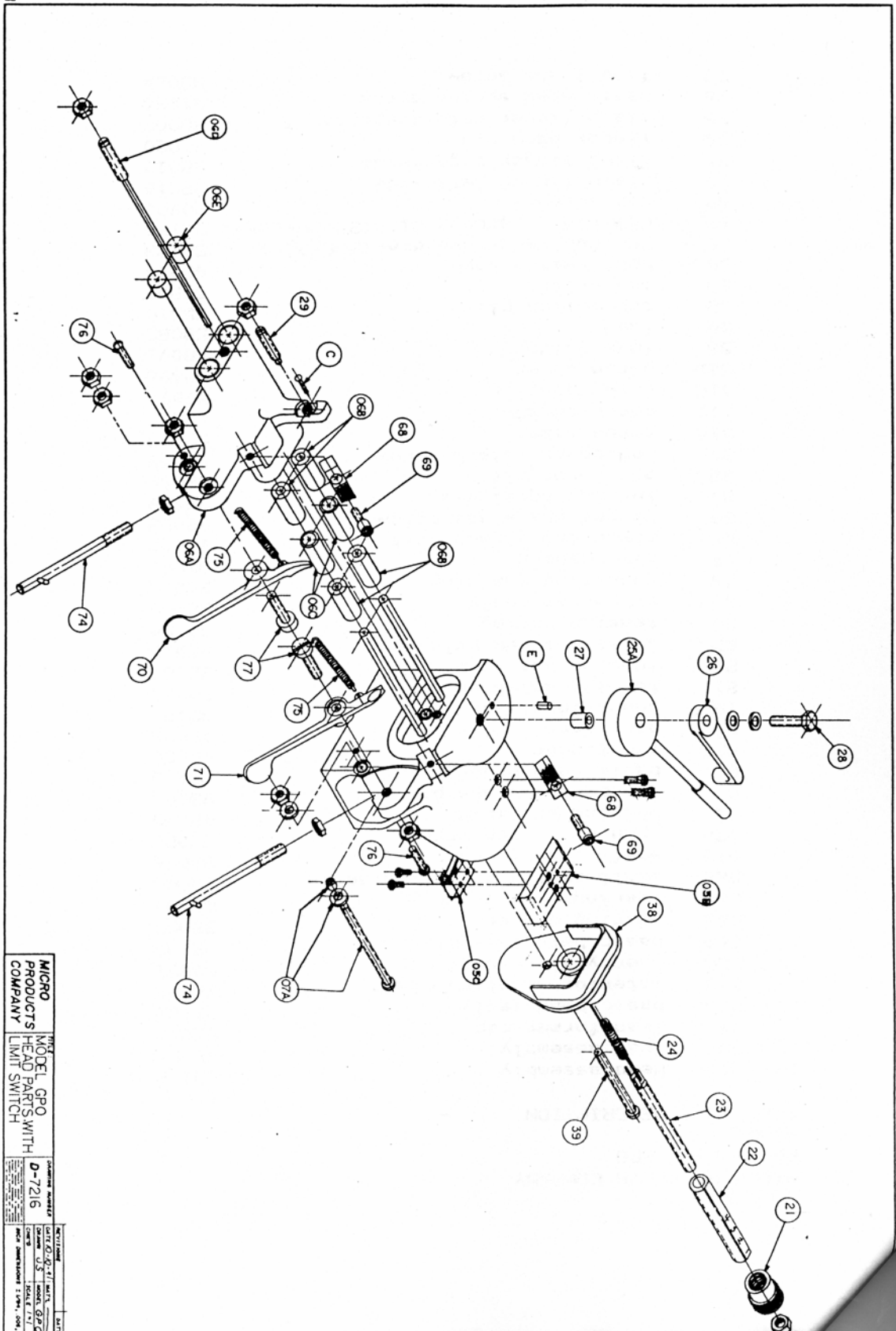
CALL MICRO at A.C. 630-787-9350

Or Toll free at 800-872-1068

Provide MICRO with your company name and purchase order number.

13.0 PARTS LIST





PARTS LIST GPO		
MODEL/ PART NO.	DESCRIPTION	ITEM #
GPO-01A	Head assembly	32118
GPO-03	Tray assembly	42051
GPO-04	Transformer cap	52001
GPO-05A	Basic head assembly	32133
GPO-05B	Interior mounting plate	32132
GPO-05C	Cherry micro switch	57851
GPO-06A	Basic head assembly	32133
GPO-06B	Bearing spacer	32057
GPO-06C	Bearing	48400
GPO-06D	Limit switch adjusting screw	52008
GPO-06E	Shaft cover	32056
GPO-07A	Open head stop screw	32028
GPO-14	Housing assembly	42075
GPO-14C	Basic head brass pin	93144
GPO-14E	Basic head groove pin	92608
GPO-14FP	Front door	42050
GPO-14BP	Back door	42033
GPO-18	Shunt insulator	37728
GPO-21	Tension adjusting knob	35564
GPO-22	Tension adjusting worm	32087
GPO-23	Tension screw nylon	35516
GPO-24	Tension spring	32059
GPO-25A	Space cam assembly	32003
GPO-26	Repeating cam stop	32000
GPO-27	Cam bushing	32002
GPO-28	Space cam attaching bolt	90203
GPO-29	Closed space adjusting screw	32082
GPO-34	Insulating sleeve	37709
GPO-38	End cover plate	32054
GPO-39	End cover attaching screw	91055
GPO-51A	Omron timer	57693
GPO-51B	Omron socket	57695
GPO-51C	Omron adapter	57694
GPO-51D	Omron cover	57696
GPO-53	Fuse holder	58091
GPO-54	Fuse	58083
GPO-62	Tap switch plate	55510
GPO-63	Tap switch	57800
GPO-64	Heat switch plate	55510
GPO-68	GPO radius groove dies (20 & 18 ga)	32123
GPO-69	GPO radius groove dies (22-24-26 ga)	32124
GPO-70	Clamp finger left wide	32016
GPO-71	Clamp finger right wide	32017
GPO-74	Finger stop pin	32020
GPO-75	Clamp finger return spring	80007
GPO-76	Basic head spring screw	91026

PARTS LIST GPO		
MODEL/ PART NO.	DESCRIPTION	ITEM #
GPO-77	Finger attaching screw	32064
GPO-90	Cable	86006
GPO-91	Kellum grip	86100
GPO-100	Back panel knob	48216
GPO-101	Terminal block assembly	42509
GPO-105	Operating switch	57843
GPO-106	Hi-low switch	57843
GPO-107	Auto manual nameplate	52034
GPO-108	Operating switch plate	52035
GPO-109	On-off switch	57839
GPO-109A	Auto-manual switch	57840
GPO-110	Hi-low nameplate	48306
GPO-111	On-off nameplate	48305
GPO-112	Truck assembly	42026
GPO-119	Shear	64002
GPO-138	Lamp	58164
GPO-141	Transformer	52049
GPO-142	Transformer ring	54512
GPO-143	Rod	93000
GPO-185	Contactor	57613